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Beetle News Adds Feature

Starting with this issue, for each article summarized we will list after the literature citation the address of the senior author. You may obtain reprints or other information by contacting this person.

Time is Crucial In Marketing Beetle-Killed Pines

Can a mill operator make a profit from beetle-killed pines? The answer, according to research comparing lumber from beetle kills with that from uninfested green trees, is yes! **But two things must be kept in mind: the length of time the timber has been dead before harvesting, and the type of lumber to be sawn.**

Time is crucial. Beetle-killed pines over time show a great drop in the percentage of No. 2 and better lumber. After 20 months on the stump, 60 percent of the 8/4 dimension lumber from beetle kills will not make No. 3 dimension lumber and must be sold as dunnage or industrial lumber.

Sap stain develops early in beetle-killed trees. By the time needles fade, the sapwood is already blue stained. Lumber from such trees should be sold as 8/4 dimension, because the Southern Pine Inspection Bureau does not degrade that size much for stain. If the pines have been dead longer, the most likely way to make a profit from them is to sell the wood as decorative boards and timbers.

SINCLAIR, S. A.

1978. Profits from beetle-killed pine? YES! Timber Pro. Ind. 3 (11): 31-33.

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New Model Developed For Describing Within-Tree Gallery Length

To further our understanding of SPB dynamics, researchers in Mississippi compared several models for describing within-tree distribution of gallery length. The chief objective of the study was to obtain a good description of the data with a model that was easy to use.

The most precise model had three variables which had not been used before: inner bark thickness at the middle of the infested bole, ratio of infested bole length to total tree height, and infested bole length multiplied by d.b.h.

With these additional variables, the new model more accurately predicted distribution of gallery length/100 cm^2 than previously used models. The investigators also proposed a technique for estimating total length of galleries in trees. This procedure may be useful in estimating total numbers of beetles by life stage.

NEBEKER, T. E., et. al.

1978. A comparison of non-linear and linear models for describing gallery length distribution of *Dendroctonus frontalis* attacking shortleaf pine. Environ. Entomol. 7 (5): 636-640.

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Reemergence Process Key to Infestation Growth?

Just how does reemergence of parent adult beetles figure in the overall scheme of SPB population dynamics? A 1976 summer study of a rapidly growing infestation in east Texas was undertaken to describe reemergence patterns to see if reemerging parent beetles responded to aggregating pheromones, and to determine probable roles of reemergence in infestation growth.

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Highest reemergence density occurred at mid-bole, began after peak attack, and continued for 16 to 20 days. Bark samples taken at the start and end of the reemergence period showed that 97 percent of attacking beetles reemerged, a considerably higher figure than previously reported from laboratory rearings.

In the laboratory, reemerging adults responded to an attractant mixture of frontalin, *trans*-verbenol, and loblolly pine turpentine. This mixture attracted significantly more reemerged adults than brood adults.

Reemergence apparently has several functions in beetle population growth. Reemerging adults may help in overcoming initial resistance by new host trees and in establishing the brood population. Also, by producing a continuous supply of pheromone, reemerging beetles ensure that the newly attacked part of an infestation continues to favor spot growth. The extended reemergence period has survival value to the insect, too, because local, short-term disasters — like harsh weather — affect only a portion of the reemerging population.

COULSON, R. N., et. al.
1978. Evaluation of the reemergence process of parent adult *Dendroctonus frontalis* (Coleoptera: Scolytidae). Can. Entomol. 110: 475-486.
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Methods Compared For Estimating Beetle's Rate of Development

Knowledge about the time it takes the southern pine beetle to develop is of keen interest to researchers and pest control officers, because such information would allow more accurate prediction of emergence dates and better timing of control strategies. A field study in Mississippi compared three methods of analyzing the relationship between the rate of SPB development and temperature.

Depending on season and temperature extremes, Method I (time between first appearance of a given life stage and appearance of the next stage) over- or underestimated predictions of Method II (time between when 50 percent of a population appeared at a given life stage and when 50 percent of the population appeared at the next stage) and Method III (time between when the maximum number was seen at a given stage and when maximum number was seen at the next stage).

All three methods showed that the beetle tended to develop faster as temperatures increased. They also revealed similar developmental trends for the summer temperatures of 21 to 26 degrees C.

During the study, temperatures ranged from 4 to 28 degrees C. Depending on season and temperature, eggs developed in 8 to 27 days, larvae took 10 to 62 days, and pupae 7 to 26 days.

MIZZELL, R. F., III, and T. E. NEBEKER.
1978. Estimating the developmental time of the southern pine beetle *Dendroctonus frontalis* as a function of field temperatures. Environ. Entomol. 7 (4): 592-595.
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Hertel Named Research Coordinator

Gerard D. Hertel in early September 1978 was named Research Coordinator for the Program. Hertel will be responsible for ensuring that results from new or continuing research are utilized in controlling the beetle.

He has worked for the U.S. Forest Service in the South for the past 12 years, first in insect research and then in insect and disease management. Hertel replaces Thomas L. Payne, who, after 4 years as Research Coordinator, resumes his duties with the Entomology Department at Texas A&M University.

New Investigations Funded

Research at Stephen F. Austin State University has been funded to develop and test risk (incidence) and hazard (severity) models based on site/stand characteristics of beetle-infested east Texas forests. J. E. Howard of the School of Forestry will use data already collected by others at the same location. The goal of this project is to provide forest managers with a way to determine the risk and severity of beetle attack.

M. P. Levi, M. Kelly, and R. G. Hitchings of the Department of Wood and Paper Science at North Carolina State University have been funded to evaluate the properties and potential use of beetle-killed wood for particle board, hardboard, and pulp. They will also determine changes in conventional processes needed to ensure high-quality products from beetle-killed pines.

Treatment of standing trees with conventional spray equipment to prevent insect attacks usually results in spray drift and contamination of nontarget areas. Researchers U. E. Brady and C. W. Berisford at the

University of Georgia have been funded to evaluate commercially available low-drift spray systems (hardware and adjuvants) to minimize this problem. Results should permit spray crews to put more toxicant on the infested portion of trees.

A number of chemical compounds produced by the southern pine beetle or its host trees, or by both, attract or inhibit beetle attacks. So far, 14 of these compounds have been isolated and a number of them have been identified. R. M. Silverstein of the College of Environmental Sciences and Forestry at the State University of New York has been funded to complete the identification of compounds that have already been isolated and shown to affect beetle behavior. Chemical synthesis will also be undertaken to confirm tentative identifications and to provide samples for other investigators engaged in field and laboratory bioassays and dispersal studies.

Behavioral Chemicals Field Tested

Researchers in east Texas conducted field tests for 3 years (1973, 1976, and 1977) to verify the roles of several chemicals thought to influence SPB flight and attack behavior. Seven compounds were tested over a wider range of combinations than had been tested before. Evaluations were made in active infestations, and beetle activity was monitored with four-vaned wing traps coated with Stickem Special.

Investigators found that frontalin, by itself, is attractive to both sexes of the southern pine beetle, and is more attractive to males than to females. Frontalin's power as an attractant is increased when it is combined with *trans*-verbenol, which may act as a substitute for host tree volatiles. The capacity of frontalin to lure beetles is also enhanced by host tree turpentine or *alpha*-pinene, although the ratio of tree volatiles did not affect the level of beetle response.

Among inhibitors, verbenone at low concentrations (0.5 mg/h) did not reduce the number of beetles attracted to traps, but did at higher concentrations (5.0 mg/h). *Endo*-brevicomin lowered the number of beetles arriving at attractant-baited traps, but *exo*-brevicomin did not. High concentrations of verbenone plus *endo*-brevicomin weakened the attractive power of each attractant chemical.

Only verbenone in high concentrations seemed to affect the sex ratio of responding beetles. This chemical reduced the number of male beetles and, therefore, balanced the ratio of responding beetles.

PAYNE, T. L., et. al.
1978. Field response of the southern pine beetle to behavioral chemicals. Environ. Entomol. 7(4): 578-582.

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Beetle-Killed Shortleaf May Lose Toughness Quickly

Preliminary data from research in Virginia indicate that strength loss may occur quickly in wood from shortleaf pines killed by beetles. Fifteen trees were selected and tested in each of four categories: control (normal, sound pine wood); light stain (dead 2 months on the stump); heavy stain and incipient decay (dead 12 months); and partial decay (dead 20 months). The wood was tested according to "traditional toughness" and "fracture toughness" standards.

Sap stain seemed to be the key to recognizing early strength loss. After 2 months dead on the stump, wood had lost 9 percent of its strength in fracture toughness tests and 7 percent in traditional tests, yet the only visible change was sap stain.

In the 12-month group, where there was heavy sap stain and some decay, fracture toughness of beetle-killed wood was 86 percent and traditional toughness 66 percent when compared with the strength of wood from green controls. In partially decayed material left in the woods 20 months, fracture strength was still 83 percent that of normal wood, but traditional toughness was only 42 percent.

SINCLAIR, S. A., J. A. JOHNSON, and G. IFJU.
1978. Changes in toughness of wood from beetle-killed shortleaf pine. For. Prod. J. 28(7): 44-47.

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Technology Transfer Plan Announced

A major outcome of ESPBRAP will be the development of integrated pest management systems. Adoption of these programs by users, however, means more than the accumulation of facts about the beetle, the forest, and various treatment approaches. Briefly put, our research must be communicated to the right people in ways that will be useful.

In response to this need, the Program has developed and printed a "Technology Transfer Plan." **Twelve application areas are discussed in terms of the gen-**

eral audience, the objective, the appropriate media, and the time schedule for accomplishment.

The plan maps out communication activities ranging from field tests, to demonstrations and workshops, to publications. Its general purposes are to encourage the commitment of forestry organizations to the transfer process and to identify areas of the Program which should be considered for technology transfer.

Writer/Editor Joins Program

Janet L. Searcy joined the ESPBRAP Pineville staff in October 1978. Formerly a writer/editor with the Navy, she will be principally responsible for editing the Program's state-of-the-art compendium, technical bulletins, and proceedings for symposia planned for the final years of the Program.

Searcy has worked as a freelance medical editor and as an instructor in high school and college business and English courses. She is co-author of a high school grammar text.

Reemergence Lower In Cooler Weather

During a 14-month period (May 1976 to July 1977) in Arkansas, investigators studied reemergence of SPB parent adults from 34 shortleaf pines. Estimates were made of reemergence as a function of season and within-tree distribution. The possibility of using gallery length or attack density to predict reemergence was also evaluated.

The influence of season on reemergence was not consistent. At all sample dates except early March, more than 50 percent of attacking adults reemerged. Variation in the percentage of reemergence, total numbers reemerging, and attack density were lower for the cooler months of September through March than for other months.

Beetle reemergence was generally reduced at the top and bottom of the tree, and attack density was lower at the top of infested trees. Gallery length was not a good predictor for beetle reemergence, but attack density was.

COOPER, M. E., and F. M. STEPHEN.
1978. Parent adult reemergence in southern pine beetle populations. Environ. Entomol. 7 (4): 574-577.

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OTHER PUBLICATIONS OF INTEREST

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1978. A stochastic model of a temperature-dependent population. Theor. Popul. Biol. 13 (2): 197-213.

Daniels, R. F.
1978. Spatial patterns and distance distributions in young seeded loblolly pine stands. For. Sci. 24 (2): 260-266.

Shore, D. G.
1978. The effects of southern pine beetle (*Dendroctonus frontalis* Zimm.) epidemics on forest watershed dynamics: will benefits justify control? M. S. Thesis. Va. Polytech. Inst. & State Univ., Blacksburg, 92 p.

Somers, G. L.
1978. Predicting mortality in precompetitive, naturally seeded stands of loblolly pine. M. S. Thesis. Va. Polytech. Inst. & State Univ., Blacksburg, 55 p.

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